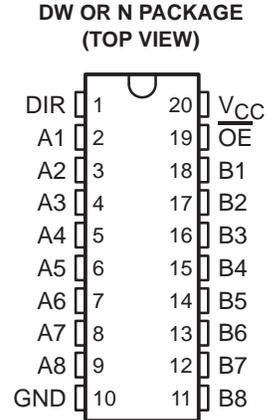


SN74ALS641A, SN74ALS642A, SN74AS641 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

- Bidirectional Bus Transceivers in High-Density 20-Pin Packages
- Choice of True or Inverting Logic
- Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (N) 300-mil DIPs

| DEVICE | LOGIC |
|------------------------|-----------|
| SN74ALS641A, SN74AS641 | True |
| SN74ALS642A | Inverting |



description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. These devices transmit data from the A bus to the B bus or from the B bus to the A bus, depending upon the level at the direction-control (DIR) input. The output-enable (\overline{OE}) input disables the device so that the buses are effectively isolated.

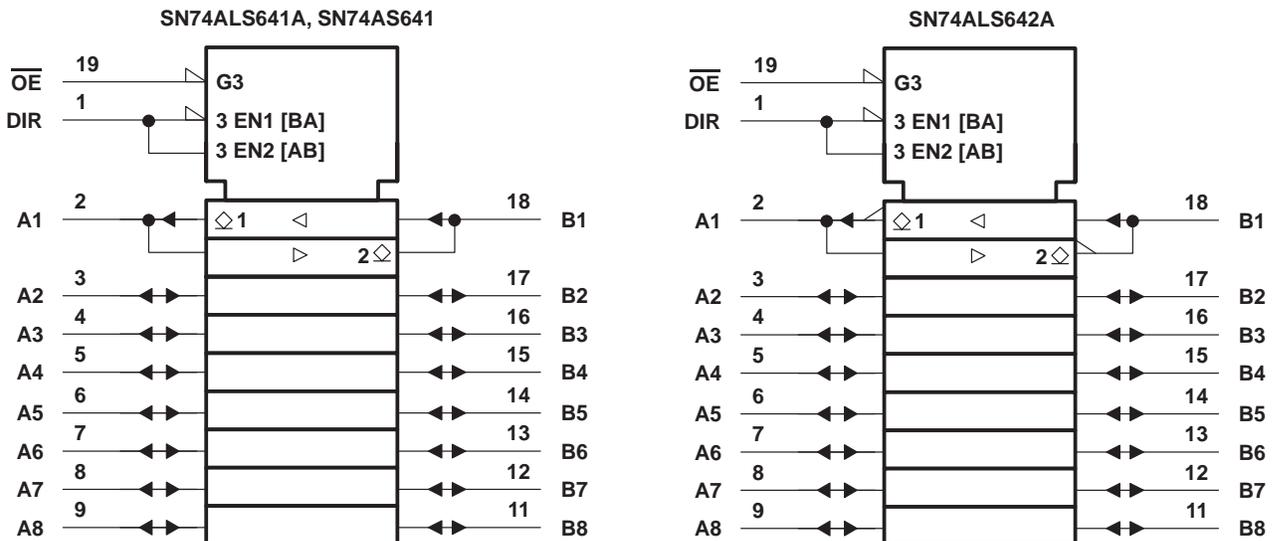
The -1 versions of the SN74ALS641A and SN74ALS642A are identical to the standard versions, except that the recommended maximum I_{OL} is increased to 48 mA in the -1 versions.

The SN74ALS641A, SN74ALS642A, and SN74AS641 are characterized for operation from 0°C to 70°C.

FUNCTION TABLE

| INPUTS | | OPERATION | |
|-----------------|-----|--------------------------|------------------------------|
| \overline{OE} | DIR | SN74ALS641A SN74AS641 | SN74ALS642A |
| L | L | B data to A bus | \overline{B} data to A bus |
| L | H | A data to B bus | \overline{A} data to B bus |
| H | X | Isolation | Isolation |

logic symbols†

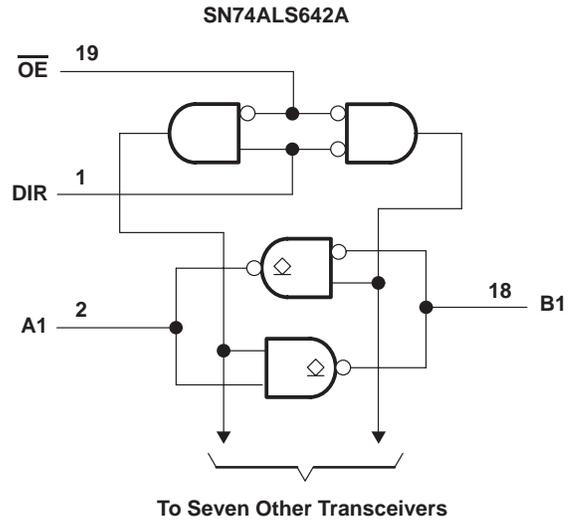
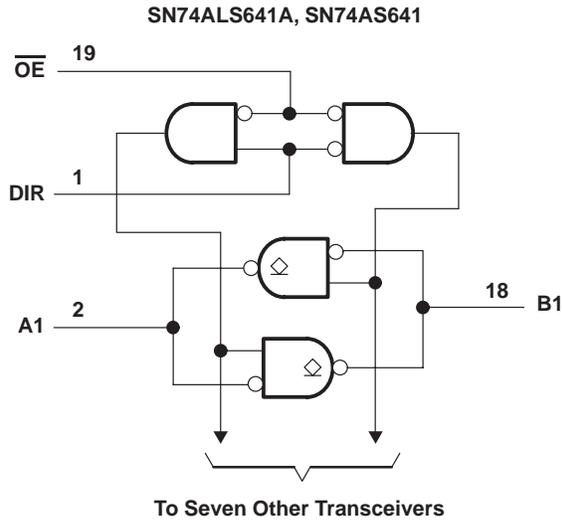


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

SN74ALS641A, SN74ALS642A, SN74AS641 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

logic diagrams (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

| | |
|--|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage, V_I : All inputs and I/O ports | 7 V |
| Operating free-air temperature range, T_A : SN74ALS641A, SN74ALS642A | 0°C to 70°C |
| Storage temperature range | -65°C to 150°C |

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

| | | SN74ALS641A SN74ALS642A | | | UNIT |
|----------|--------------------------------|----------------------------|-----|-----------|------|
| | | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2 | | | V |
| V_{IL} | Low-level input voltage | | | 0.8 | V |
| V_{OH} | High-level output voltage | | | 5.5 | V |
| I_{OL} | Low-level output current | | | 24 48‡ | mA |
| T_A | Operating free-air temperature | 0 | | 70 | °C |

‡ Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V

SN74ALS641A, SN74ALS642A, SN74AS641
OCTAL BUS TRANSCEIVERS
WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | SN74ALS641A SN74ALS642A | | UNIT |
|-----------------|----------------|--------------------------|--------------------------|----------------------------|------|------|
| | | | | MIN | TYP† | |
| V _{IK} | | V _{CC} = 4.5 V, | I _I = -18 mA | | -1.5 | V |
| I _{OH} | | V _{CC} = 4.5 V, | V _{OH} = 5.5 V | | 0.1 | mA |
| V _{OL} | | V _{CC} = 4.5 V | I _{OL} = 12 mA | 0.25 | 0.4 | V |
| | | | I _{OL} = 24 mA | 0.35 | 0.5 | |
| | | | I _{OL} = 48 mA‡ | 0.35 | 0.5 | |
| I _I | Control inputs | V _{CC} = 5.5 V, | V _I = 7 V | | 0.1 | mA |
| I _{IH} | Control inputs | V _{CC} = 5.5 V, | V _I = 2.7 V | | 20 | µA |
| | A or B ports§ | | | | 20 | |
| I _{IL} | Control inputs | V _{CC} = 5.5 V, | V _I = 0.4 V | | -0.1 | mA |
| | A or B ports§ | | | | -0.1 | |
| I _{CC} | SN74ALS641A | V _{CC} = 5.5 V | Outputs high | 25 | 37 | mA |
| | | | Outputs low | 33 | 47 | |
| | SN74ALS642A | V _{CC} = 5.5 V | Outputs high | 8 | 15 | |
| | | | Outputs low | 18 | 28 | |

† All typical values are at V_{CC} = 5 V, T_A = 25°C.

‡ Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V

§ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 680 Ω, T _A = MIN to MAX¶ | | | | UNIT |
|------------------|------------------------|----------------|---|-----|-------------|-----|------|
| | | | SN74ALS641A | | SN74ALS642A | | |
| | | | MIN | MAX | MIN | MAX | |
| t _{PLH} | A or B | B or A | 5 | 25 | 10 | 30 | ns |
| t _{PHL} | | | 3 | 18 | 5 | 22 | |
| t _{PLH} | $\overline{\text{OE}}$ | A or B | 8 | 30 | 10 | 30 | ns |
| t _{PHL} | | | 8 | 30 | 15 | 38 | |
| t _{PLH} | DIR | A or B | 8 | 32 | 10 | 30 | ns |
| t _{PHL} | | | 8 | 32 | 15 | 38 | |

¶ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

SN74ALS641A, SN74ALS642A, SN74AS641

OCTAL BUS TRANSCEIVERS

WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

| | |
|---|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage, V_I : All inputs and I/O ports | 7 V |
| Operating free-air temperature range, T_A : SN74AS641 | 0°C to 70°C |
| Storage temperature range | -65°C to 150°C |

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

| | | SN74AS641 | | | UNIT |
|----------|--------------------------------|-----------|-----|-----|------|
| | | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2 | | | V |
| V_{IL} | Low-level input voltage | | | 0.8 | V |
| V_{OH} | High-level output voltage | | | 5.5 | V |
| I_{OL} | Low-level output current | | | 64 | mA |
| T_A | Operating free-air temperature | 0 | | 70 | °C |

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | SN74AS641 | | | UNIT | |
|-----------|--|---------------------------|----------------------|----------------------|-------|----|
| | | MIN | TYP‡ | MAX | | |
| V_{IK} | $V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$ | | | -1.2 | V | |
| I_{OH} | $V_{CC} = 4.5\text{ V}$, $V_{OH} = 5.5\text{ V}$ | | | 0.1 | mA | |
| V_{OL} | $V_{CC} = 4.5\text{ V}$, $I_{OL} = 64\text{ mA}$ | | 0.35 | 0.55 | V | |
| I_I | Control inputs | $V_{CC} = 5.5\text{ V}$ | | $V_I = 7\text{ V}$ | 0.1 | mA |
| | A or B ports§ | | | $V_I = 5.5\text{ V}$ | 0.1 | |
| I_{IH} | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 2.7\text{ V}$ | | 20 | µA |
| | A or B ports§ | | | | 70 | |
| I_{IL} | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 0.4\text{ V}$ | | -0.5 | mA |
| | A or B ports§ | | | | -0.75 | |
| I_{CC} | $V_{CC} = 5.5\text{ V}$ | Outputs high | | 50 | 82 | mA |
| | | Outputs low | | 84 | 136 | |

‡ All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

§ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.



SN74ALS641A, SN74ALS642A, SN74AS641
OCTAL BUS TRANSCEIVERS
WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

switching characteristics (see Figure 1)

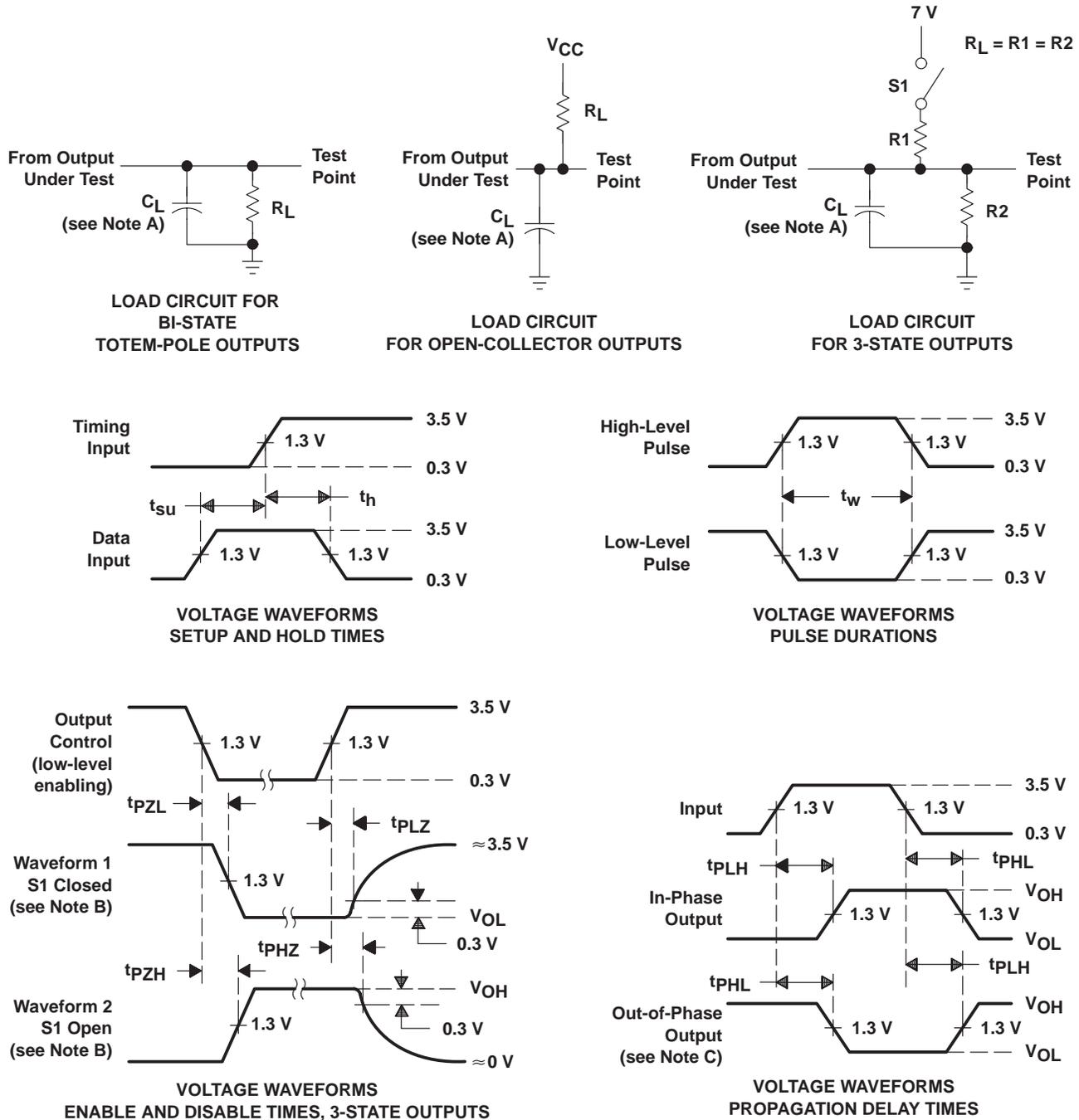
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 680 Ω, T _A = MIN to MAX† | | UNIT |
|------------------|-----------------|----------------|---|-----|------|
| | | | SN74AS641 | | |
| | | | MIN | MAX | |
| t _{PLH} | A or B | B or A | 5 | 21 | ns |
| t _{PHL} | | | 1 | 7.5 | |
| t _{PLH} | \overline{OE} | A or B | 5 | 21 | ns |
| t _{PHL} | | | 1 | 9 | |
| t _{PLH} | DIR | A or B | 5 | 22 | ns |
| t _{PHL} | | | 1 | 10 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

SN74ALS641A, SN74ALS642A, SN74AS641
 OCTAL BUS TRANSCEIVERS
 WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

PARAMETER MEASUREMENT INFORMATION
 SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A. C_L includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. When measuring propagation delay items of 3-state outputs, switch S1 is open.
 D. All input pulses have the following characteristics: $PRR \leq 1$ MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms



PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|--------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74ALS641A-1DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641A-1DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641A-1DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641A-1DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641A-1N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS641A-1NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS641A-1NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641A-1NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641ADW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641ADWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641ADWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641ADWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641AN | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS641ANE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS641ANSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS641ANSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642A-1DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642A-1DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642A-1DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642A-1DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642A-1N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS642A-1NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74ALS642A-1NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642A-1NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74ALS642ADW | OBSOLETE | SOIC | DW | 20 | | TBD | Call TI | Call TI |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/Ball Finish | MSL Peak Temp ⁽³⁾ |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74ALS642ADWR | OBSOLETE | SOIC | DW | 20 | | TBD | Call TI | Call TI |
| SN74ALS642AN | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI |
| SN74AS641DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AS641DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AS641DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AS641DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74AS641N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |
| SN74AS641NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type |

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

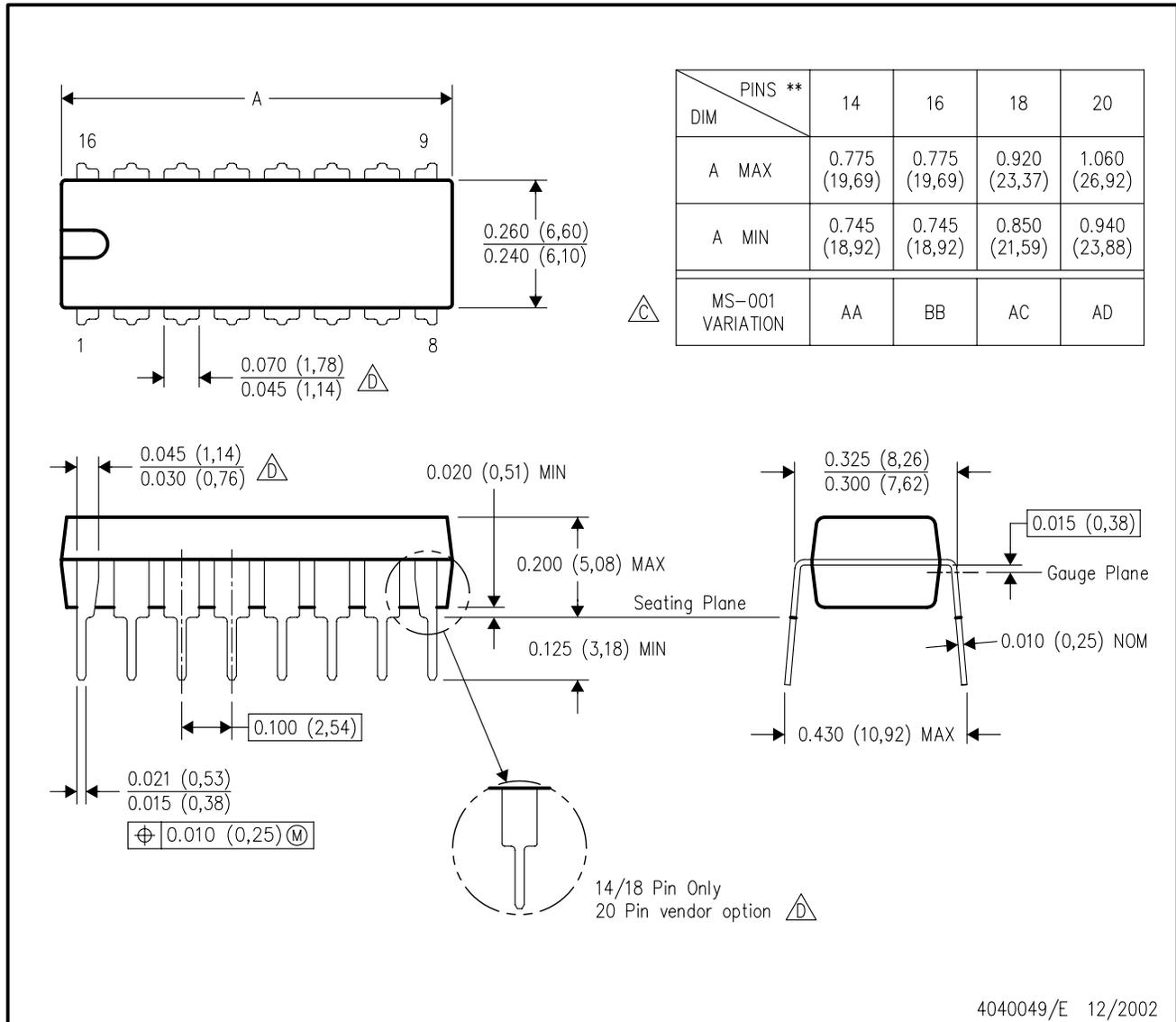
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

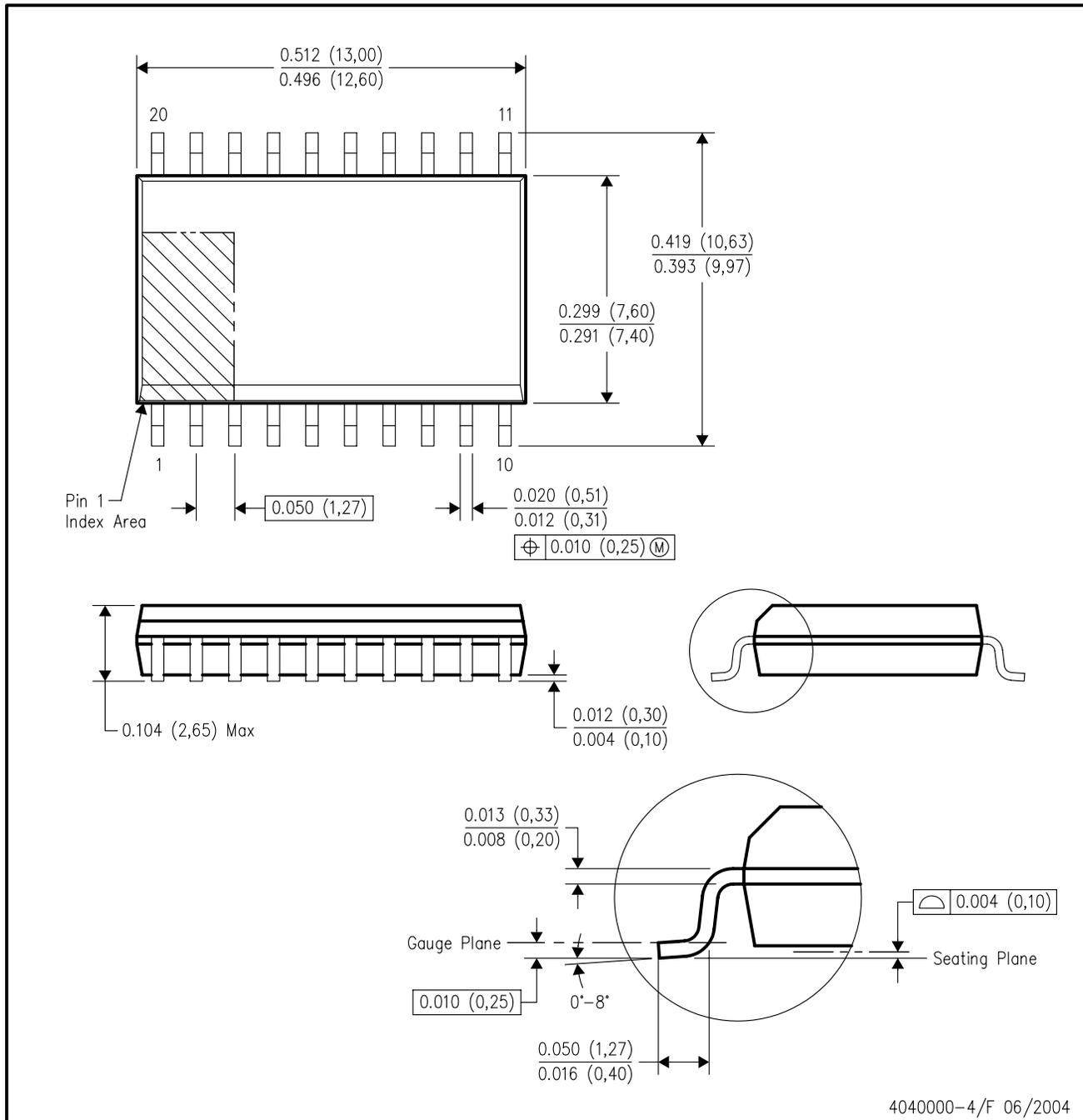
16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



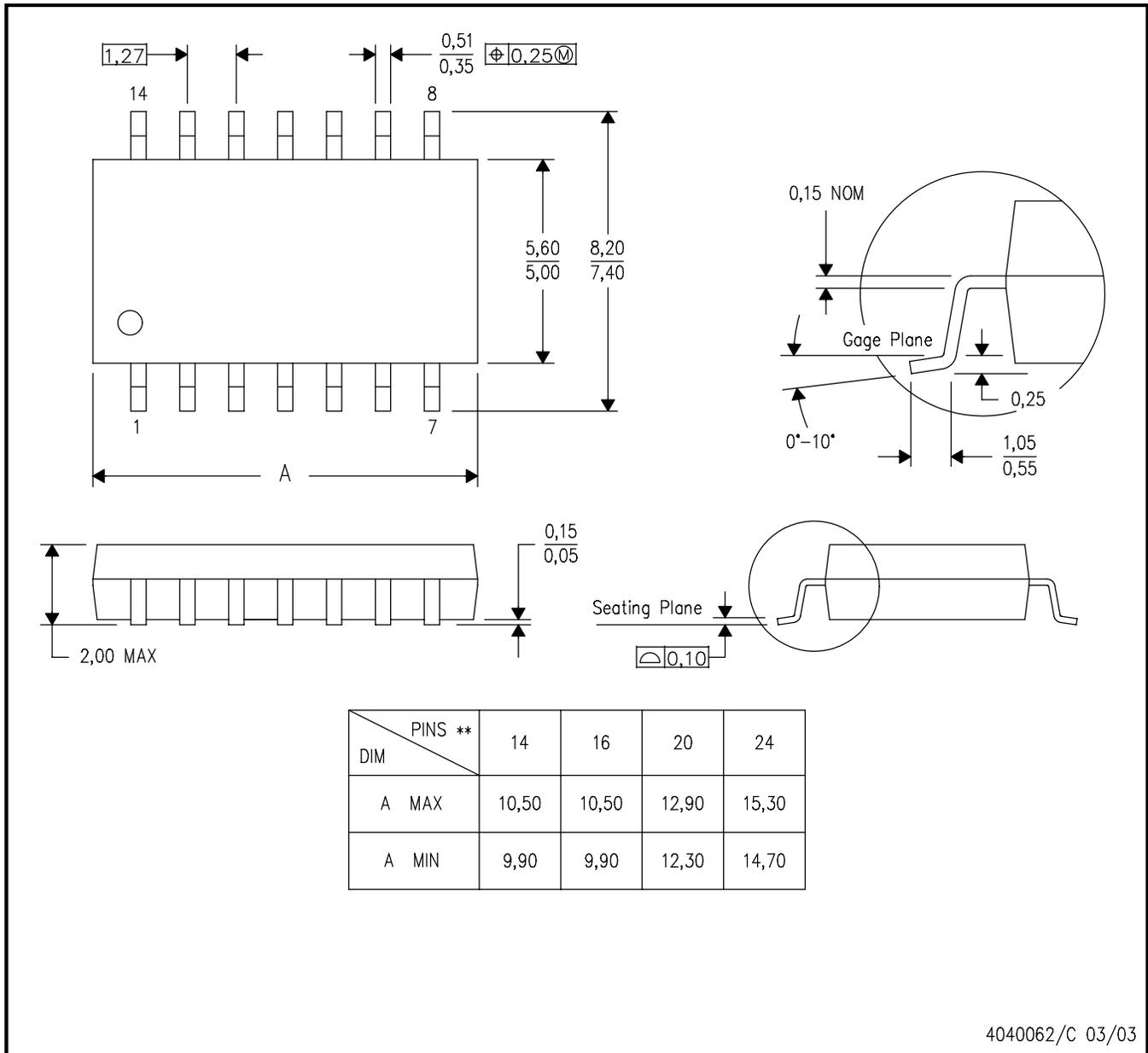
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AC.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| Products | | Applications | |
|--------------------|--|---------------------|--|
| Amplifiers | amplifier.ti.com | Audio | www.ti.com/audio |
| Data Converters | dataconverter.ti.com | Automotive | www.ti.com/automotive |
| DSP | dsp.ti.com | Broadband | www.ti.com/broadband |
| Interface | interface.ti.com | Digital Control | www.ti.com/digitalcontrol |
| Logic | logic.ti.com | Military | www.ti.com/military |
| Power Mgmt | power.ti.com | Optical Networking | www.ti.com/opticalnetwork |
| Microcontrollers | microcontroller.ti.com | Security | www.ti.com/security |
| Low Power Wireless | www.ti.com/lpw | Telephony | www.ti.com/telephony |
| | | Video & Imaging | www.ti.com/video |
| | | Wireless | www.ti.com/wireless |

Mailing Address: Texas Instruments
Post Office Box 655303 Dallas, Texas 75265